

METHOD OF FABRICATING A BOTTLE SHAPED DEEP TRENCH FOR TRENCH CAPACITOR DRAM DEVICES

Abstract

A method for fabricating a bottle-shaped deep trench in a semiconductor substrate is disclosed. A pad stack layer is formed on a main surface of the semiconductor substrate. A deep trench is etched into the substrate through the pad stack layer. The deep trench has a vertical sidewall and a bottom surface. A CVD silicon nitride thin film is deposited on the interior surface of the deep trench. Subsequently, the upper portion of the CVD silicon nitride thin film is bombarded with inert gas ions by tilt-angle ion implantation. The bombarded upper portion of the CVD silicon nitride thin film is then selectively etched away to expose the substrate in the deep trench. The remaining CVD silicon nitride thin film at the lower portion of the deep trench serves as an oxidation mask. A thermal oxidation is carried out to oxidize the exposed substrate to form a silicon oxide layer at the neck of the deep trench. The oxidation mask is then stripped off to expose the lower portion of the deep trench, which is isotropically etched to

form a bottle-shaped deep trench.